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Why does air travel cause earache?

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When travelling in airplanes, people reach altitudes at which the total gas pressure is much lower than that at sea level. They must reduce middle ear pressure in order to equilibrate with the external pressure. The difference in pressure between the middle ear and the eustachian tube at high altitudes is large, even in pressurized aircraft. In this situation, pressure regulation usually takes place when the gas escapes from the middle ear through the eustachian tube to the nasopharynx.

Eustachian tube dysfunction is the major etiologic factor in the development of otitis media. When the airplane descends to sea level, the reverse occurs and pressure equalization takes place by the ventilation of the eustachian tube. In this case, the eustachian tube opens periodically and gas goes into the middle ear from the eustachian tube. Most of the patients who experience ear pain during flight develop this problem at descent rather than ascent because of the anatomy of the eustachian tube. The eustachian tube orifice on the nasopharyngeal side has elastic lips and can be closed up by the relatively high pressure in the nasopharynx.

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Infants and children may suffer from functional eustachian tube obstruction as a result of either decreased tubal stiffness or an inefficient active opening mechanism of the eustachian tube. They are at higher risk of developing middle ear disease during flight. In addition, patients who suffer from severe seasonal allergy or common colds, ciliary dysfunction, sinonasal disease, and immunodeficiency are at higher risk of developing otitis media during flight. Children with pressure equalization tubes can fly safely, because the pressure equalization in the middle ear takes place without relying on the function of the eustachian tube.

Most people are able to equilibrate this pressure difference with ease on descent or ascent. Some people may need to perform maneuvers to perform autoinflation, known as the Valsalva maneuver, a technique involving forced nasal expiration with the nose and lips closed. Small children may have difficulty performing this maneuver. For infants, drinking milk from a bottle during ascent and descent may aid in middle ear pressure regulation. When this maneuver fails, negative middle ear pressure may develop and can be painful. If the negative pressure in the middle ear is strong enough, serum transudate or blood may appear. This phenomenon is called barotrauma and can be easily diagnosed with an otoscope. You will see an effusion that may be hemorrhagic. In barotrauma, the actual negative pressure in the middle ear can be expected to exceed 60mm to 90 mm of water, the level at which middle ear transudate starts.

Serous otitis and hemotympanum can result in conductive hearing loss, up to 30 dB to 40 dB initially, and patients begin to have difficulty understanding faint speech. Usually the hemotympanum is self-limited and clears by the fourth to sixth week. Myringotomy is usually not recommended because this can introduce infection. If serous effusion is present, a trial of Medrol dose pack usually resolves the problem completely. If the patient has ruptured the tympanic membrane with barotrauma, I recommend the use of oral antibiotics.

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